

REMARKS

The Office Action dated December 5, 2008, has been received and carefully considered. In this response, claims 1-3, 9, and 11 have been amended and claim 12 has been added. No new matter has been added. Entry of the amendments to claims 1-3, 9, and 11 and the addition of claim 12 is respectfully requested. Reconsideration of the current rejections in the present application is also respectfully requested based on the following remarks.¹

I. THE INFORMATION DISCLOSURE STATEMENT

An Information Disclosure Statement and accompanying PTO-1449 form were filed on February 7, 2008. There is presently no indication that the Examiner considered the references identified in that Information Disclosure Statement. Accordingly, the Examiner is respectfully requested to acknowledge consideration of the references identified in that

¹ As Applicants' remarks with respect to the Examiner's rejections are sufficient to overcome these rejections, Applicants' silence as to assertions made by the Examiner in the Office Action or certain requirements that may be applicable to such rejections (e.g., assertions regarding dependent claims, whether a reference constitutes prior art, whether references are legally combinable for obviousness purposes) is not a concession by Applicants that such assertions are accurate or such requirements have been met, and Applicants reserve the right to analyze and dispute such in the future.

Information Disclosure Statement by initialing the PTO-1449 form and returning a copy of the initialed form to the undersigned.

II. THE ENABLEMENT REJECTION OF CLAIMS 3-8

On page 4 of the Office Action, claims 3-8 were rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to make and/or use the invention. This rejection is hereby respectfully traversed.

Regarding claim 3, the Examiner asserts that the specification fails to describe how transition-limiting codes with different degrees of reduction or elimination of full-swing transitions have been generated. Regarding claim 6, the Examiner asserts that the specification fails to describe how transition-limiting codes with different sampling rates have been generated. The Examiner goes on to assert that claims 4 and 5 and claims 7 and 8 are dependent upon claims 3 and 6 and thus should be treated similarly.

Applicants respectfully respond to the assertions of the Examiner by again emphasizing that the claims are directed to a method for determining an optimal transition-limiting code for use in a multi-level signaling system, and not creating and/or generating a transition-limiting code. That is, the claims are

directed to a method for determining an optimal transition-limiting code out of a plurality of transition-limiting codes that have already been created and/or generated. As discussed in more detail below, Applicants respectfully submit that it is clear that persons of ordinary skill in the art are well aware of transition-limiting codes. However, as discussed above, the claims are directed to a method for determining an optimal transition-limiting code out of a plurality of transition-limiting codes that have already been created and/or generated for use in a multi-level signaling system (i.e., not creating and/or generating a transition-limiting code). The specification fully supports this claimed methodology at, for example, paragraph [0011] to paragraph [0016]; and paragraph [0037] to paragraph [0059]. Thus, Applicants respectfully submit that persons of ordinary skill in the art, upon reading the specification, would be enabled to make and/or use the claimed invention.

Applicants again respectfully submit that the specification is replete with descriptions of transition-limiting codes, and particularly transition-limiting codes with different degrees of reduction or elimination of full-swing transitions and transition-limiting codes with different sampling rates. For example, the specification recites:

transition-limiting codes . . . reduce or eliminate the number of full-swing transitions (FST) between sequential symbols in a multi-level signaling system. Reducing or eliminating the number of FST between sequential symbols enhances system performance in terms of: 1.) voltage margins (Vm), by reducing peak distortion (PD) via the elimination of one or more worst case sequences; and 2.) timing margins (Tm), especially at outer eyes where FST close eyes the most.

(paragraph [0008]). The specification also recites:

transition-limiting codes . . . secure a minimum density of desirable symbol transitions useful for clock recovery. These clock data recovery (CDR) transitions prevent continuous phase drifting from an optimum sampling point at the center of an eye in plesiochronous systems with frequency offsets between received data and a local receive clock.

(paragraph [0009]). The specification further recites:

. . . at least some of the plurality of transition-limiting codes may beneficially have different sampling rates. If such is the case, determining the coding gain for each of the plurality of transition-limiting codes may beneficially comprise selecting a first transition-limiting code having a first sampling rate, determining the coding gain of a data transmission over a channel operating at a predetermined data rate in the multi-level signaling system utilizing the first transition-limiting code based at least in part upon the first sampling rate, and then repeating these steps utilizing a

second transition-limiting code having a second sampling rate. Alternatively, determining the coding gain for each of the plurality of transition-limiting codes may beneficially comprise characterizing a first pulse response for a channel operating at a predetermined data rate in the multi-level signaling system utilizing a first transition-limiting code having a first sampling rate, determining the coding gain of a data transmission over the channel using the first transition-limiting code based at least in part upon the first pulse response, and then repeating these steps utilizing a second transition-limiting code having a second sampling rate.

(paragraph [0013]). The specification still further recites:

[t]ransition-limiting codes . . . eliminate the number of full-swing transitions (FST) between sequential symbols in a multi-level signaling system. These transition-limiting codes . . . provide useful clock data recovery (CDR) transitions. Other transition-limiting codes . . . reduce the number of full-swing transitions (FST) between sequential symbols in a multi-level signaling system. These other transition-limiting codes . . . usually provide useful clock data recovery (CDR) transitions.

(paragraph [0031]). The specification still further recites:

[t]he use of transition-limiting codes has the direct and indirect effects of: 1.) reduction of maximum transition swing $\max|\Delta d_i| = 2/3 - \max|\Delta d_i| = 4$; 2.) change of the line rate $(1r)$, and therefore $h_i^e \neq h_i^*$; and 3.) further attenuation of the pulse response h_0 , which also represents channel attenuation.

(paragraph [0036]). The specification still further recites:

transition-limiting codes can increase the resilience of multi-level line codes to reflections. By reducing or eliminating full-swing transitions these transition-limiting codes can reduce peak and mean square distortion, and increase the timing margins.

(paragraph [0059]). Also, the two provisional applications (i.e., U.S. Provisional Patent Application Nos. 60/450,349 and 60/494,561) to which the present application claims priority, and the entirety of which are incorporated by reference in the present application, are equally replete with descriptions of transition-limiting codes. Thus, Applicants respectfully submit that persons of ordinary skill in the art, upon reading the specification, would be enabled to make and/or use the claimed invention.

Further, Applicants respectfully submit that persons of ordinary skill in the art are well aware of the term transition-limiting code based upon numerous readily available publications that clearly describe transition-limiting codes. For example, the following papers and patent publications are readily available and clearly describe transition-limiting codes: U.S. Patent Nos. 5,859,601, 6,526,530, 6,819,137, 6,917,312,

7,113,550, 7,180,957, 7,180,958, 7,180,959, and 7,302,631; U.S. Patent Application Publication Nos. US2004/0109510A1, US2003/0152154A1, US2006/0126751A1, US2005/0099325A1, US2004/0240580A1, US2004/0208257A1, US2004/0170231A1, and US2004/0109509A1; International Patent Application Publication Nos. WO/1998/044633 and WO/2004/053810; A. Bessios et al., Transition-limiting codes for 4-PAM signaling in high speed serial links, Global Telecommunications Conference, 2003, GLOBECOM '03, IEEE, Volume 7, pages 3747-3751, December 1-5, 2003; and V. Stojanovic, Channel-Limited High Speed Links: Modeling, Analysis and Design, PhD Dissertation, Stanford University, September 2004. Regarding the above-referenced patent publications, some of which actually claim the creation of transition limiting codes, it almost incomprehensible that the Examiner is asserting that he was unable to find a definition for the term transition-limiting code. Thus, in view of the foregoing, Applicants respectfully submit that persons of ordinary skill in the art, upon reading the specification, would be enabled to make and/or use the claimed invention.

Also, claim 1 recites specific steps for determining an optimal transition-limiting code for use in a multi-level signaling system (i.e., not creating and/or generating a transition-limiting code). The steps comprise determining a

coding gain for each of a plurality of transition-limiting codes; selecting one of the plurality of transition-limiting codes having a largest coding gain for use in the multi-level signaling system; and employing the selected transition-limiting code in the multi-level signaling system to at least reduce a number of full-swing transitions between sequential signals. Each of these steps is well supported in the specification and described in such a manner as to enable one skilled in the art to make and/or use the claimed invention (e.g., see paragraphs [0011]-[0014], [0037], [0052], [0054], [0056], [0058], and [0059] in U.S. Patent Application Publication No. US2004/0170231A1). The remaining claims are equally well supported in the specification. Thus, Applicants respectfully submit that persons of ordinary skill in the art, upon reading the specification, would be enabled to make and/or use the claimed invention.

In view of the foregoing, it is respectfully requested that the aforementioned enablement rejection of claims 3-8 be withdrawn.

III. THE INDEFINITENESS REJECTION OF CLAIM 9

On page 5 of the Office Action, claim 9 was rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for

failing to particularly point out and distinctly claim the invention. This rejection is hereby respectfully traversed.

The Examiner asserts that the limitation "a first component based upon a sampling rate of a pulse response for a channel operating at a predetermined data rate in the multi-level signaling system utilizing the transition-limiting code" is vague and indefinite. Applicants respectfully disagree. However, in order to forward the present application toward allowance, Applicants have amended claim 9 to remove this limitation. It should be noted, however, that this limitation is well supported in the specification in a clearly defined manner. See, e.g., paragraphs [0037]-[0038]. Indeed, claim 1 has been amended to substantially include this limitation based upon its clear specification support and its relevance to determining coding gain, as claimed.

In view of the foregoing, it is respectfully requested that the aforementioned indefiniteness rejection of claim 9 be withdrawn.

IV. THE NON-STATUTORY SUBJECT MATTER REJECTION OF CLAIMS 1-9
AND 11

On pages 2-3 of the Office Action, claims 1-9 and 11 were rejected under 35 U.S.C. § 101 as being directed to non-

statutory subject matter. This rejection is hereby respectfully traversed.

Regarding claim 1, the Examiner asserts that a statutory process under 35 U.S.C. § 101 must be tied to another statutory category (such as a particular apparatus). Claim 1 has been amended to recite an encoder for encoding signals using the selected transition-limiting code. Such an encoder clearly falls within another statutory class. Support for such an encoder may be implicitly found throughout the specification (See, e.g., paragraph [0060]), as well as explicitly found throughout the two provisional applications (i.e., U.S. Provisional Patent Application Nos. 60/450,349 and 60/494,561) to which the present application claims priority, and the entirety of which are incorporated by reference in the present application. Claims 2-9 are all dependent upon claim 1 and thus also include this encoder limitation.

Regarding claim 11, the Examiner asserts that: 1.) the term "for storing" should be replaced by the term "storing;" and 2.) the specification is limited to a processor readable carrier signal. Regarding 1, claim 11 has been amended to recite the term "storing." Regarding 2, Applicants respectfully disagree. The specification explicitly states that "it is within the scope of the present invention that such instructions may be stored on

one or more processor readable carriers (e.g., a magnetic disk)." Clearly, a magnetic disk or other processor readable storage media are not signals as the Examiner asserts. Also, there is a long list of cases that clearly define a storage medium as being statutory subject matter. For example, Applicants direct the Examiner's (and the Board's) attention to the case law set forth in In re Beauregard, 53 F.3d 1583, (Fed. Cir. 1995), In re Lundgren, 76 USPQ2d 1385 (Bd. Pat. App. & Int. 2005), and others, which clearly provide a patentable subject matter basis for a storage medium. Claim 12 has been added to further encompass this subject matter.

In view of the foregoing, it is respectfully requested that the aforementioned non-statutory subject matter rejection of claims 1-9 and 11 be withdrawn.

V. THE OBVIOUSNESS REJECTION OF CLAIMS 1, 2, AND 11

On pages 5-6 of the Office Action, claims 1, 2, and 11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Applicants Admitted Prior Art in view of Truman (U.S. Patent Application Publication No. US2004/0037421A1). This rejection is hereby respectfully traversed.

Under 35 U.S.C. § 103, the Patent Office bears the burden of establishing a prima facie case of obviousness. In re Fine,

837 F.2d 1071, 1074 (Fed. Cir. 1988). There are four separate factual inquiries to consider in making an obviousness determination: (1) the scope and content of the prior art; (2) the level of ordinary skill in the field of the invention; (3) the differences between the claimed invention and the prior art; and (4) the existence of any objective evidence, or "secondary considerations," of non-obviousness. Graham v. John Deere Co., 383 U.S. 1, 17-18 (1966); see also KSR Int'l Co. v. Teleflex Inc., 127 S. Ct. 1727 (2007). An "expansive and flexible approach" should be applied when determining obviousness based on a combination of prior art references. KSR, 127 S. Ct. at 1739. However, a claimed invention combining multiple known elements is not rendered obvious simply because each element was known independently in the prior art. Id. at 1741. Rather, there must still be some "reason that would have prompted" a person of ordinary skill in the art to combine the elements in the specific way that he or she did. Id.; In re Icon Health & Fitness, Inc., 496 F.3d 1374, 1380 (Fed. Cir. 2007). Also, modification of a prior art reference may be obvious only if there exists a reason that would have prompted a person of ordinary skill to make the change. KSR, 127 S. Ct. at 1740-41.

Regarding claim 1, the Examiner asserts that the claimed invention would have been obvious in view of Applicants Admitted

Prior Art and Truman. Applicants respectfully disagree. However, in order to forward the present application toward allowance, Applicants have amended claim 1 to more specifically define the claimed invention, and specifically those features that further differentiate the claimed invention from Applicants Admitted Prior Art and Truman, as well as the other cited references. In particular, Applicants respectfully submit that Applicants Admitted Prior Art and Truman, fail to disclose, or even suggest, a method for determining an optimal transition-limiting code for use in a multi-level signaling system determining a coding gain for each of a plurality of transition-limiting codes in the multi-level signaling system, wherein the coding gain for each of the plurality of transition-limiting codes is based at least in part upon a sampling rate of a pulse response for a channel operating at a predetermined data rate in the multi-level signaling system utilizing the transition-limiting code, as presently claimed. In contrast, Applicants Admitted Prior Art simply discloses transition limiting codes in general and Truman simply discloses choosing a codebook that provides the largest coding gain.

At this point, Applicants would like to respectfully remind the Examiner that, as stated in MPEP § 2143.03, to establish *prima facie* obviousness of a claimed invention, all the claim

limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981 (CCPA 1974). That is, "[a]ll words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382 (CCPA 1970).

In view of the foregoing, Applicants respectfully submit that claim 1 is allowable over Applicants Admitted Prior Art and Truman.

Regarding claims 2 and 11, these claims are dependent upon independent claim 1. If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. In re Fine, 837 F.2d 1071 (Fed. Cir. 1988). Thus, since independent claim 1 should be allowable as discussed above, claims 2 and 11 should also be allowable at least by virtue of their dependency on independent claim 1. Moreover, these claims recite additional features which are not disclosed, or even suggested, by the cited references taken either alone or in combination.

In view of the foregoing, it is respectfully requested that the aforementioned obviousness rejection of claims 1, 2, and 11 be withdrawn.

VI. CONCLUSION

In view of the foregoing, it is respectfully submitted that the present application is in condition for allowance, and an early indication of the same is courteously solicited. The Examiner is respectfully requested to contact the undersigned by telephone at the below listed telephone number, in order to expedite resolution of any issues and to expedite passage of the present application to issue, if any comments, questions, or suggestions arise in connection with the present application.

To the extent necessary, a petition for an extension of time under 37 CFR § 1.136 is hereby made.

Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-0206, and please credit any excess fees to the same deposit account.

Respectfully submitted,

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